

## Seasonal Focus Lab

Life Sciences

Grade 5

**Focus:** Inheritance of Traits and Natural Selection

### NGSS & Environmental Principals

### Relation to Program

#### Disciplinary Core Idea (DCI)

**LS1.A Structure & Function:** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (5-LS1-1)

**LS1.B Growth and Development of Organisms:** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (5-LS1-1)

**LS1.C Organization of Matter and Energy Flow in Organisms:** Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

**LS5.A Inheritance of Traits:** Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (5-LS5-1)

**LS5.B Variation of Traits:** Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops. (5-LS2-1)

**LS5.B Natural Selection:** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (5-LS5-1)

**LS5.C Adaptation:** For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (5-LS5-1)

*In the lab*, students will examine the parts of a plant and relate these structures to their function in relation to reproduction, survival, and growth. Students will observe how reproduction is essential for plant survival and that they rely on pollinators to do so.

*During the walk*, students will be able to observe the plants as a larger whole, identifying, reflecting, and noting the form and functions of roots, leaves, bark, flowers, etc. Students will be reminded that –like animals –plants need food, water, and energy (from the sun) to survive and have specific parts (roots, stems, leaves, flowers) that help them obtain these needs. They are encouraged to observe these plant parts on different species and asked whether or not they are all the same. Through observation and investigation, students will note that plant parts can vary in physical characteristics from species to species. Docents will ask students why these changes exist and how might the environment play a role. This docent-led discussion will help students reach the conclusion that plants have different characteristics to help them survive under certain conditions/environments.

Students will learn that in order for a plant species to continue to exist, individuals must survive long enough to reach maturity and reproduce. If plants have characteristics that do not help it survive, they are less likely to reproduce and pass their genes on to the next generation. Alternatively, if a plant has a characteristic that gives it an advantage in its environment, it has greater chances of reproducing. As a result, unfavorable traits become less common in a population while favorable traits appear more often. Throughout their walk, students will observe how plants and animals change their environment to survive (e.g. build nests, make burrows, overgrow landscapes) which can inadvertently alter the

**LS5.D Biodiversity and Humans:** Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (5-LS5-1)

**ESS2.E Biogeology:** Living things affect the physical characteristics of their regions. (5-ESS2-1)

ecosystem. Docents will prompt students to think of examples of any human activity that could dramatically change a landscape. Students will be reminded that animals—including humans—rely on plants for food and services (e.g. shelter, wood, oxygen) and without them our way of life would dramatically change.

### Crosscutting Concepts (CCC)

**Patterns:** Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.
- Patterns can be used as evidence to support an explanation.

**Cause and Effect:** Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

**Structure & Function:** The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

**Stability and Change:** For both designed and natural systems, conditions that affect stability and factors that control rates of change are elements to consider and understand.

- Change is measured in terms of differences over time and may occur at different rates.

Some systems appear stable, but over long periods of time will eventually change.

*In the lab*, students will observe the different parts of a plant and, through inquiry, relate those structures to their purpose. Patterns in the similarities and differences between different plant species will also be observed and connected to their habitat.

*During the walk*, students will be able to see the shape and stability of trees and other plants and how the lab relates to the natural world. Students will be able to recognize the reemerging pattern that basic plant parts (roots, stems, leaves, flowers) provide different services to the plant to help it survive and occur on all plants. From one plant to another, these parts may have different forms in order to help it survive in its habitat. A plant that was once able to live in an environment but no longer is found there could suggest a dramatic change within the area (e.g. fire, climate change, drought). Likewise, present-day plant adaptations can be used to reveal characteristics of a habitat.

By the nature of the design of the tour, students will understand that the environment is constantly changing and plants and animals have to adapt to these changes to survive. Although a habitat may appear to be stagnant, micro-changes occur on a daily basis and over many years it will undergo several changes.

## Science & Engineering Practices (SEP)

**Asking Questions and Defining Problems:** Asking questions and defining problems in grades 3-5 builds on grades K-2 experiences and progresses to specifying qualitative relationships.

- Ask questions about what would happen if a variable is changed.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- Use prior knowledge to describe problems that can be solved.

**Planning and Carrying Out Investigations:** Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or designed solutions.

- Make observations and/or measurements to produce data to serve as the basis of evidence for an explanation of a phenomenon or test a designed solution.
- Make predictions about what would happen if a variable changes.

**Constructing Explanations and Designing Solutions:** Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).
- Use evidence (e.g. measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.

**Engaging in Argument from Evidence:** Engaging in argument from evidence in 4-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence, data, and/or a model

*During the lab and walk,* students are encouraged to ask questions about their surroundings and why things are occurring in nature. These inquiries will lead to observations and investigations in the pursuit of answering these questions. Afterwards, students will use their findings to describe patterns that reoccur throughout the Garden and make predictions on an explanation of a phenomenon.

*After the tour,* students will have the relevant evidence to construct an account and model of plants' form and function as it relates to their survival and adaptations and the interdependency of plants and animals.

## Performance Expectations (EP)

**5-LS1-1 From Molecules to Organisms: Structures & Processes:** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

*In the lab* students will learn about how each plant part serves one or more functions for the plant and that they are necessary for their survival.

*On the walk*, students will observe how each plant part serves one or more functions for the plant and that they are necessary for their survival. These plant parts may have adaptations in order to help it survive better in its environment.

## California's Environmental Principle(s) & Concept(s)

**Principle I:** The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

- **Concept a:** Goods produced by natural systems are essential to human life and to the functioning of our economies and cultures.
- **Concept b:** Ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.

**Principle III:** Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

- **Concept a:** Natural systems proceed through cycles and processes that are required for their functioning.
- **Concept b:** Human practices depend upon and benefit from the cycles and processes that operate within natural systems.
- **Concept c:** Human practices can alter the cycles and processes that operate within natural systems.

*In the lab*, students will learn how animals, including humans, rely on food and oxygen produced by plants to survive.

*On the walk* students are encouraged to make assumptions based on their observations about how the health of the ecosystems within the Garden will affect the health of its plants and animals. Students will get to walk down Mission Creek and see how the animals within it rely on plants for food which, in turn, rely on the water and nutrients from the creek.

Students are shown through examples how the condition of an environment affects the organisms living in it. As students come to understand these changes in the environment can alter natural cycles and lead to the prosperity, hardship, and demise of different organisms they will be prompted to wonder if human practices ever alter habitats. By the end of the tour, students will realize that human changes to an environment can have just as much of an effect as natural alterations do. Students will be reminded how humans depend on plants and animals for resources and food and that these changes will have consequences on our way of life.

## CA CCSS, ELA/ELD & Math

**SL.5.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

- Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
- Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

**W.5.1:** Write opinion pieces on topics or texts supporting a point of view with reasons and information.

**W.5.2:** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

*During the tour*, students are engaged through inquiry-based learning and encouraged to ask why something is a certain way. These questions will lead to group investigation and discussion towards the discovery of the reason.

*After this program*, students will have the relevant evidence to describe plants' external structures, how they relate to their survival, how and why these parts may change over time, how organisms are interconnected with themselves and their environment, and how humans rely on plants and natural systems in order to live.